

THE UNIVERSITY OF HONG KONG
DEPARTMENT OF ELECTRICAL & ELECTRONIC ENGINEERING

Lab no.: BS01

Title : Testing Conductors and Protective Devices

Location : Electrical Services Application Laboratory Rm. HW316 Haking Wong Building

Objective: a) To study the tripping characteristics of miniature circuit breaker, and IDMTL Earth Fault Relay;
b) To familiarize procedures of Low Resistance test, and Insulation Resistance test.

Apparatus: AVO, Current Injection Tester, Megger Tester, and Ductor Tester;
MCBs, IDMT Earth Fault Relay, Distribution Board, and Bar Conductor.

Introduction:

Before we connect electricity to an electrical installation, an engineer must firstly ensure that the components shall perform safely according to specifications, and their workmanship shall not produce adverse effects.

This laboratory gives the students hands on experience on three selected tests which are commonly required for electrical installations. The three tests are namely: Current Injection Test; Low Resistance (Ductor) Test; and Insulation (Megger) Test.

The current injection test is to ensure that protective devices shall operate as designed. The low ductor test is to ensure that the conductors are connected with good electrical continuity. The megger test is to ensure that the circuits do not have unacceptable leakage or dielectric breakdown.

Procedures:

A. Current Injection Test

1. Get familiar with the current injection tester. Also familiarize with the meters available. Read carefully any operation instruction/manual provided.
2. Check sensitivity of the devices to be tested. Plan meaningful settings according to trade practices; and prepare recording charts before your start the tests.
3. According to the instrument operation manual, or following instruction of the demonstrators, adjust the operation settings of the tester as per your plan.
4. Set up the apparatus, and connect the device correctly to the tester.
5. Press the switch to inject current to the device.
6. Record temperature and other ambient parameters. Record settings, currents, and operating times.
7. Do the tests with various settings for the given IDMTL earth-fault relay. Repeat procedure 1 to 6 for the given MCB. Do the tests a) b) and c) one by one. In principle, each subsequent test must not commence before the MCB has been cooled down sufficiently.

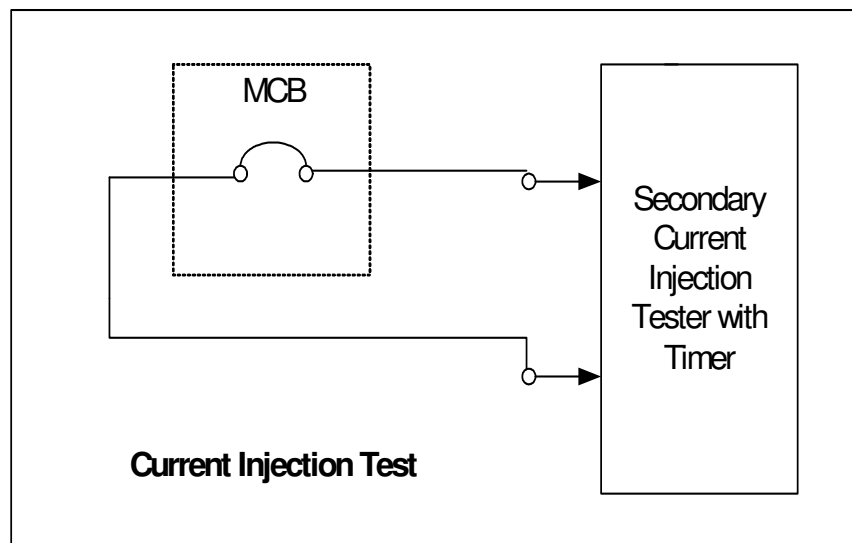
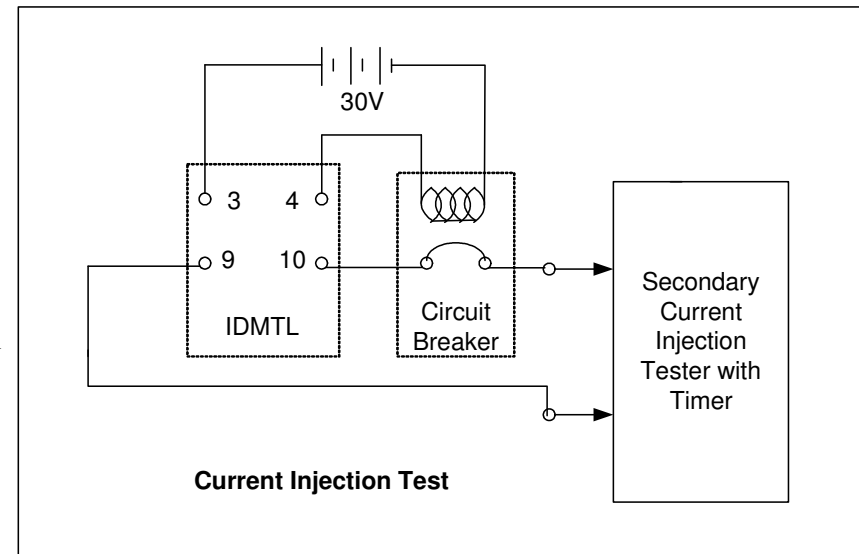


Figure A



Results:**A. Current Injection Test**

Installation Code. _____

Temp _____ °C

Test by _____

Humidity _____ %

Witness by _____

Test Date: _____

I. Earth Fault Relay

Type _____

Make _____

Serial No _____

	Current Setting (% or A) = _____				Current Setting (% or A) = _____			
	T.M. = 1.0		T.M. = 0.5		T.M. = 1.0		T.M. = 0.5	
	Current	Op. Time	Current	Op. Time	Current	Op. Time	Current	Op. Time
Current Multiple								
2	A	s	A	s	A	s	A	s
3	A	s	A	s	A	s	A	s
5	A	s	A	s	A	s	A	s
10	A	s	A	s	A	s	A	s

II. MCB

Type: _____

Make: _____

Rating: _____

Current (A)	Op. Time in sec	Highest Current (A)	Lowest Current (A)
$I_{inj} = 2.55 I_n =$			
$I_{inj} = d I_n =$			
$I_{inj} = e I_n =$			

Values of d & e by Types			
d		e	
B	C	B	C
3	5	5	10

Procedures:**B. Low Resistance Test**

1. Familiarize with the ductor.
2. Check its battery.
3. Deliberately make the joint/ connection in poor contact.
4. Put the probes across the joint/ connection to be tested.
5. Observe reading.
6. Reverse the probes and test again.
7. Take the average reading.
8. Tighten the joint without a spring washer.
9. Repeat 4 to 7.
10. Tighten the joint with full set of accessories.
11. Repeat 4 to 7.

Joint Resistance Values in mΩ

1 st +ve Reading	1 st -ve Reading	2 nd +ve Reading	2 nd -ve Reading	3 rd +ve Reading	3 rd -ve Reading

Note that in 2500 A circuits, the joint resistances are normally in $\mu\Omega$ range.

Procedures:

C. Insulation Test

1. Identify the distribution board (D/B) to be tested; and the loads connected to the D/B.
2. Coordinate with users and switch off all connected loads.
3. Isolate voltage-delicate loads (e.g. some electronics)
4. Switch off MAIN switch to the D/B.
5. Remove D/B cover by a proper tool, and place screws in an organizer next to the D/B.
6. If more than 50 outlets, form groups of 50 or less.
7. Disconnect the main neutral connection slowly. Stop the disconnection when there is spark.
8. Record room temp and humidity.
9. Inspect no one is touching any live or protective part. Check zero calibration.
10. Measure the insulation resistance (IR) across conductors of phases, neutral and earth by a MEGGER tester (usually at test voltage 500V).
Take reading when the meter reading becomes steady. If single-phase, 3 readings. If 3 phase, 10 readings.
11. Review consistency and logic of readings.
12. If any reading too low, search for procedural error and control circuits on D/B before marking it as failure.
13. When confirm low, identify/highlight the circuit for follow-up.
14. Perform supplementary IR tests on loads being isolated, but exclude voltage-delicate loads. Also refer to #12 & 13.
15. Finish the test. Remember to reconnect all circuits (often some neutral circuits have been disconnected for micro-check) as per their original layout.
16. Reconnect main neutral.
17. Double check no. of tools; and ensure no screws in D/B .
18. Switch on Main.
19. Switch on individual final circuits to the same condition as before the test. Confirm resume of supply to the loads with user.
20. Polish presentation of actual readings; and arrange for follow up action (if necessary).

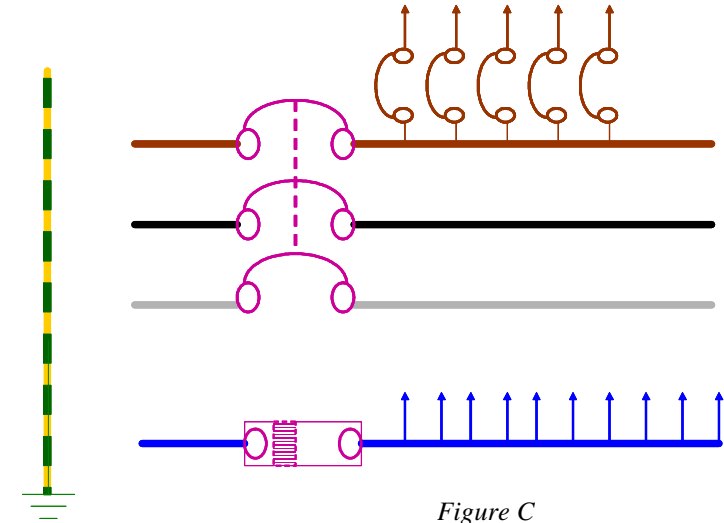


Figure C

Results:**C. Insulation Test**

DB Code: _____

Temp _____ °C

Test by _____

Humidity _____ %

Witness by _____

Test Date: _____

Remark on recent humidity: _____

IR Values

in MΩ	1-phase			3-phase										Remark
	LE	NE	LN	L1-E	L2-E	L3-E	N-E	L1-N	L2-N	L3-N	L1-L2	L2-L3	L3-L1	
DB														
cct														
cct														
cct														
cct														
cct														